

MEMORANDUM

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FROM: Ernest G. Johnson
for Director
Utilities Division

DATE: May 19, 2004

RE: STAFF REPORT REGARDING STATUS OF QUALITY OF SERVICE IN
SANTA CRUZ COUNTY AND ANALYSIS OF ALTERNATIVES KNOWN
TO STAFF TO RESOLVE SERVICE CONCERNS (DOCKET NO. E-01032A-
99-0401)

Attached is an Arizona Corporation Commission Staff ("Staff") Report regarding the status of quality of service in Santa Cruz County and an analysis of alternatives known to Staff for resolving prevailing service concerns. This report supplements and augments all previous Staff Reports filed with the Commission regarding this matter. This report is Staff's response to Decision No. 67506.

Staff has revisited the topic of quality of electric service in Santa Cruz County in this report. An update of service quality prevalent today has been compared with what Staff found to exist in its 1999 investigation. Staff offers the following conclusions and opinions based upon an effort to think outside the box regarding service concerns and potential solutions for consumers in Santa Cruz County.

1. Numerous improvements to distribution system facilities, operational practices and service restoration procedures have been made by Citizens Communication Company ("Citizens"), Tucson Electric Power ("TEP") and UniSource Energy Services ("UES") since Staff made its 1999 finding of unacceptable service.
2. Customer complaints regarding quality of service in Santa Cruz County have dissipated since 1998 as the above numerous improvements have occurred.
3. It is Staff's opinion that distribution service in Santa Cruz County is appreciably better today than in 1998.
4. Nevertheless, none of the distribution system improvements and operational improvements made by Citizens, TEP and UES can ensure continuity of service following a transmission line outage.
5. It is Staff's opinion that transmission service to Santa Cruz County is no better today than it was when the Commission ordered construction of the second transmission line.

Continuity of service following a transmission line outage will not be achievable until a second transmission line is in service.

6. Transmission delivery service to Santa Cruz County will begin to deteriorate in 2008 as a result of depending upon Reliability-Must-Run ("RMR") generation to meet peak load.
7. By 2010 the UES transmission and generation infrastructure will be unable to reliably meet the load serving demands of Santa Cruz County even if the Gateway 345 kV and 115 kV Project is constructed. Therefore, Staff concludes transmission or generation infrastructure improvements complementing the second transmission line need to be in place by 2010. Otherwise, Santa Cruz County customers will be exposed to interruptions of service or planned curtailments during peak hours of the year.

Therefore, Staff recommends that construction of a second transmission line to Santa Cruz County remain a priority. This is the only technical means of assuring continuity of service to consumers for a transmission line outage. Secondly, Staff recommends that a technical solution to the RMR generation condition commencing in 2008 must be selected by December 31, 2005, in order to ensure timely implementation. Finally, Staff remains open to considering the merits of different nominal system voltages for the second transmission line to Nogales and various transmission and generation solutions to the RMR condition that any party chooses to suggest.

EGJ:JDS:red

Originator: Jerry D. Smith

Attachment: Original and thirteen copies

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**STAFF REPORT
UTILITIES DIVISION
ARIZONA CORPORATION COMMISSION**

**STAFF UPDATED ANALYSIS OF
SANTA CRUZ COUNTY RELIABILITY
AND NEED FOR A SECOND TRANSMISSION LINE**

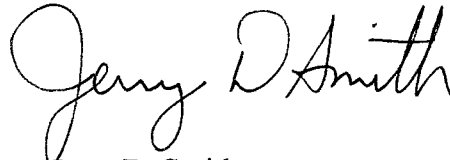
**STAFF RESPONSE TO DECISION NO. 67506
DOCKET NO. E-01032A-99-0401**

MAY 19, 2005

STAFF ACKNOWLEDGMENT

This report concerns the quality of electric service currently existing in Santa Cruz County. It contrasts the present quality of service with the inadequate service prevalent in 1998. It documents improvements made by Citizens Communications Company ("Citizens"), Tucson Electric Power ("TEP"), and UniSource Energy Services ("UES") since 1998. The report also documents the myriad of technical solutions known to Staff for solving the prevailing and emerging transmission service reliability problems in Santa Cruz County.

The report was prepared for the Commission by Jerry Smith. Mr. Smith was Staff's witness in all other proceedings regarding this matter and for the siting of the required second transmission line to Nogales. He was responsible for the review and analyses of the companies' application, review of the Commission's records of each company, determining their compliance with Commission policies/rules and reviewing customer complaints filed with the Commission regarding this matter. Mr. Smith also performed the engineering and technical analysis, and recommended action appropriate for pending delays in the construction of a second transmission line to serve Santa Cruz County in a prior Staff Report dated October 31, 2003. This report also supplements findings documented in Staff Reports filed on March 11, 2004 and May 20, 2004.

A handwritten signature in black ink that reads "Jerry D. Smith". The signature is written in a cursive, flowing style.

Jerry D. Smith
Electric Utility Engineer

TABLE OF CONTENTS

	<u>PAGE</u>
PURPOSE OF STAFF REPORT.....	1
FRAMEWORK OF QUALITY OF SERVICE ASSESSMENTS.....	1
STATUS OF DISTRIBUTION SERVICE IN SANTA CRUZ COUNTY.....	3
STATUS OF TRANSMISSION SERVICE TO SANTA CRUZ COUNTY	7
ANALYSIS OF ALTERNATIVE TRANSMISSION RELIABILITY SOLUTIONS.....	10
STAFF CONCLUSIONS AND RECOMMENDATIONS.....	12

EXHIBITS

IEEE STANDARD 1366: Guide for Electric Power Distribution reliability Indices	Exhibit 1
RUS BULLETIN 1730-1	Exhibit 2
1998 SANTA CRUZ COUNTY OUTAGE HISTORY	Exhibit 3
2004 SANTA CRUZ COUNTY OUTAGE HISTORY	Exhibit 4
MARCH 11, 2004 STAFF REPORT	Exhibit 5
MAY 20, 2004 STAFF SUFFICIENCY ASSESSMENT OF TEP AND UES	Exhibit 6
ACC STAFF COMMENTS TO DRAFT EIS DOE/EIS-0336	Exhibit 7

PURPOSE OF STAFF REPORT

On January 20, 2005 the Arizona Corporation Commission (“ACC” or “Commission”) ordered in its Decision No. 67506 that Docket No. E-01032A-99-0401 and Decision No. 62011 be re-opened. The Commission took such action for the specific purpose of reviewing the status of reliability and need for a second transmission line serving Santa Cruz County. A March 14, 2005 Procedural Order further ordered that the ACC Staff (“Staff”) should file a Staff Report that addresses the status of electric transmission and distribution reliability and service quality in Santa Cruz County. The Procedural Order required that the Staff Report present Staff’s analysis of the proposed alternatives of which Staff is aware at the time for meeting reliability and service concerns. This report serves as Staff’s response to Commission Decision No. 67506 and the associated March 14, 2005 Procedural order.

This report supplements and augments prior Staff Reports filed regarding quality of electric service concerns in Santa Cruz County. This Staff Report has a four fold purpose. It first describes the framework of ACC quality of service assessments by making a distinction between resource adequacy, transmission reliability and distribution reliability. Secondly, it documents the status of distribution service in Santa Cruz County and steps taken by Tucson Electric Power Company (“TEP”) and UniSource Energy Services (“UES”) to improve such service. Then it addresses the status of transmission service in Santa Cruz County and reaffirms the need for transmission reliability improvements. Finally, the Staff Report addresses known and proposed alternative solutions to transmission reliability concerns.

FRAMEWORK OF QUALITY OF SERVICE ASSESSMENTS

Regulatory requirements for quality of electric service to be provided by jurisdictional utilities are defined by the Commission’s rules. Those rules are located in Article 2 of Title 14, Chapter 2 of the Arizona Administrative Codes (“A.A.C.”). Engineering Staff (“Engineering”) monitors quality of service matters for electric utilities in the state of Arizona in accordance with A.A.C. R14-2-208 which describes the provision of service required of electric utilities. The specific performance categories covered by ACC rule R14-2-208 are 1) continuity of service, 2) service interruptions, 3) curtailments, and 4) construction standards and safety.

In addition, utilities are required to phone and report outages to the Commission’s Consumer Services Section within two hours of an interruption in service to its entire system or a significant portion thereof.¹ The phone call is to be followed by a written report of the outage to the Commission. For utilities of UES’ size, a significant portion of its entire system is defined by ACC Utility Division practices as an event resulting in more than 100 customer hours of service interruption.

The quality of service provided by a utility is partially determined by the aggregate reliability of its distribution, transmission and supply systems. It is the reliability component of

¹ A.A.C. R14-2-208.D.5.

electric service quality that is presently in question for Santa Cruz County. Unfortunately, Arizona's statutes and rules are silent in regard to defining a measure of reliable service. Therefore, judging the level of service provided by a utility's distribution, transmission or supply systems has been difficult for Staff to consistently establish over time.

Distribution System Reliability

Many utilities use numerical indices as a measure of an average customer's distribution service reliability. Such reliability indices are typically computed on an annual basis. A utility may then set reliability targets based upon benchmarked data from its own system. The Institute of Electrical and Electronic Engineers ("IEEE") adopted a Standard 1366 which defines several reliability indices for electric distribution systems and established a national benchmark database via a 1995 IEEE survey of the electric utility industry.

The most commonly used reliability indices are System Average Interruption Frequency Index ("SAIFI"), System Average Interruption Duration Index ("SAIDI"), and Customer Average Interruption Duration Index ("CAIDI"). SAIFI is the average number of interruptions experienced by customers per year. SAIDI is the average number of interruption minutes experienced by customers per year. CAIDI is the average duration of an interruption and is equal to SAIDI divided by SAIFI. The IEEE 1995 Survey established typical reliability index values for the electric utilities in the United States as displayed in the following table.

Table 1
Typical Reliability Index Values for US Utilities²

Average	SAIFI	SAIDI	CAIDI
Top quartile	0.90	54	55
Second quartile	1.10	90	76
Average	1.26	117	88
Third quartile	1.45	138	108
Bottom quartile	3.90	423	197

The Rural Utilities Service ("RUS") considers a SAIDI of five hours (300 minutes) or more per consumer as unacceptable except under very unusual circumstances, such as a natural disaster.³ Such RUS requirements would imply a utility with rural service need only be in the third quartile per Table 1 to be considered acceptable. It is Staff's opinion that a rural service area undergoing significant growth and urbanization may not be considered reliable if exhibiting reliability index values less than the average listed in Table 1.

Distribution substations and generators are typically interconnected via a network of high voltage ("HV") and extra high voltage ("EHV") transmission lines. The transmission network

² 1995 IEEE Survey

³ Rural Utilities Service Bulletin 1730-1, Form 300 Rating Guide, Condition 7, January 26, 1998.

and power plants are planned, designed and operated in a fashion to ensure continuity of service. This is in direct contrast to distribution facilities that experience interruption of service as a result of an outage of a single distribution system element. While the reliability indices previously described can be effective in managing reliability improvements in distribution systems they are not effective measures for determining transmission reliability or resource adequacy.

Transmission System Reliability

The Commission's Engineering Staff performs a Biennial Transmission Assessment in accordance with Arizona Revised Statute §40-360.02.G to determine to what degree the existing and planned transmission system facilities in Arizona adequately meet the energy needs of the state in a reliable manner. The Commission has adopted a North American Reliability Council ("NERC") definition of reliability for Staff's use in its Biennial Transmission Assessment. Transmission and supply reliability is comprised of two components: adequacy and security. Adequacy is the ability of an electric system to supply the aggregate electrical demand and energy requirements of its customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements. On the other hand, security is the ability of an electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements. These components of reliability are very subjective, are not easily measured and leave much to interpretation.

NERC and the Western Electricity Coordinating Council ("WECC") are struggling with the selection and development of appropriate quantitative measures for transmission and resource adequacy determinations. In the meantime, these reliability organizations continue to apply established planning criteria to ensure future reliable service. For reliable real-time operation in the Western Interconnection, WECC requires that all entities comply with their Minimum Operating Reliability Criteria ("MORC").⁴ MORC is applicable under all conditions, even when facilities required for secure and reliable operation have been delayed or are forced out of service. MORC principles applicable to transmission system operation are:

- The interconnected power system shall be operated at all times so that system instability, uncontrolled separation, cascading outages, or voltage collapse will not occur as a result of a single or multiple contingencies of significantly high likelihood.
- Continuity of service to load is the primary objective of the MORC. Preservation of interconnections during disturbances is a secondary objective except when preservation of interconnections will minimize the magnitude of load interruption.

STATUS OF DISTRIBUTION SERVICE IN SANTA CRUZ COUNTY

The Commission provides the opportunity for consumers to file complaints regarding the quality of service received from utilities under its regulatory jurisdiction. It was the voluminous

⁴ http://www.wecc.biz/documents/library/procedures/WECC_Reliability_Criteria_Dec04.pdf

filing of customer complaints regarding quality of electric service in Santa Cruz County that caused Docket No. E-01032A-99-0401 to be opened in 1999. The nature of customer complaints ranged from claims of equipment damage, flickering lights and shrinking size of TV screen displays coupled with an unacceptable frequency and duration of service interruptions. On October 27, 1998, the City of Nogales ("City" or "Nogales") filed a formal complaint with the Commission regarding degradation of service provided by Citizens Utilities ("Citizens") in Santa Cruz County.

The 1998 outage history provided by Citizens verified and confirmed the legitimacy of Santa Cruz County customers' claim of an excessive number of service interruptions.⁵ The 1998 outage history is attached to this report as Exhibit 3. A number of those 1998 outages were of lengthy duration. The record reflects that the average hours of outage experienced annually by a customer rose from 3.5 hours in 1997 to 12.3 hours in 1998. The associated number of customer service interruptions rose from 545 in 1997 to 584 in 1998. Staff concluded in 1999 that the quality of service to customers in Santa Cruz County was unacceptable.⁶

The Commission approved a settlement agreement between Citizens and the City of Nogales in its June 29, 1999 Decision No. 61793 that dismissed the City's complaint. That settlement resolved all outstanding Nogales claims via numerous financial commitments by Citizens. The monetary provisions of the settlement included a direct payment of \$15 to all customers of Santa Cruz County. The Nogales settlement also committed the City and Citizens to developing a mutually acceptable service upgrade plan for submission to the Commission. That plan was subsequently submitted to the Commission as Citizens' Plan of Action for its Santa Cruz Electric Division and served as the foundation for an agreement between Citizens and the Commission approved by Decision No. 62011.

Numerous improvements have been made to the distribution system in Santa Cruz County since Staff made its 1999 finding of unacceptable service. Initial distribution improvements included Citizens' repair of a Sonoita Substation transformer, replacement of damaged lightning arrestors, and replacement of an oil-cooling fin to resolve an oil leak. The second stage of distribution system improvements resulted from Citizens' implementation of its Plan of Action for the Santa Cruz Electric Division approved by Decision No. 62011.⁷ Citizens aggressively commenced an extensive power pole and underground cable replacement program throughout Santa Cruz County in 1999. Consolidation of customer connections to single phase overhead feeders and installation of new feeder sectionalizing switches with automatic reclosing reduced the exposure to sustained storm outages previously prevalent with multi-phase feeders. Citizens also modified substation voltage regulators previously used for individual feeders to achieve substation bus voltage regulation of all feeders connected at each substation. Citizens' development and use of new system operating procedures, numerous local dispatch center improvements, and enhanced Supervisory Control and Data Acquisition ("SCADA") capability were equally important in improving the quality of service to Santa Cruz County.

⁵ Docket No. E-01032A-98-0611, April 6, 1999, Testimony of Jerry D. Smith, Exhibit JS-2, pages 2-13.

⁶ Docket No. E-01032A-98-0611, April 6, 1999, Testimony of Jerry D. Smith, page 4, lines 12-18.

⁷ Decision No. 62011, Finding of Facts 15.

On July 3, 2003, the Commission approved a UniSource Energy Corporation ("UNS") acquisition of Citizens' gas and electric utility business in Arizona.⁸ UNS formed UES after the acquisition for the purpose of providing electric service in Citizens' prior service territories including Santa Cruz County. UNS is the parent holding company of both TEP and UES. The acquisition was accompanied by a Staff expectation that TEP's engineering and operational support of UES regarding system improvements and operational integrity would improve the quality of customer service to Santa Cruz County. As a result of this acquisition, a third stage of distribution system improvements commenced in Santa Cruz County.

TEP and UES filed with the Commission an updated Outage Response Plan for Santa Cruz County. Staff's assessment of the sufficiency of that plan is documented in its March 11, 2004 and May 20, 2004 Staff Reports which are provided as Exhibits 5 and 6. TEP's and UES' Outage Response Plan integrates operational control of UES' facilities into TEP's control centers as outlined in Table 2.

Table 2
Integration of UES into TEP's Operation Control Centers

Task	Time Savings	Est. Cost	When
Remote monitoring and control of Santa Cruz County substations.	5-10 minutes	\$60,000	May 2004
Remote startup, control & synchronization Of Valencia generating units.	45 minutes	\$40,000	May 2004
GIS data conversion to: SmallWorld	-	+	July 2004
STORMS	-	+	Oct. 2004
Outage Management System (OMS)	-	\$300,000	Dec. 2004

On May 27, 2004, TEP demonstrated to Staff the remote startup control of the Valencia generating units and synchronization with the Western Interconnection transmission system. Similarly, TEP has also demonstrated to Staff its remote restorative switching capability to reestablish service to UES distribution substations following an outage. TEP's and UES' Outage Response Plan also includes procedures to restore service to Kantor and Cañez Substations via a newly constructed 46 kV emergency tie line between TEP's Canoa Substation and UES' Kantor Substation. All of these operational integration improvements were completed in 2004 and will effectively reduce the time to restore service to customers following outage of the existing 115 kV transmission line serving Santa Cruz County as depicted in Table 3. It is Staff's opinion that TEP and UES have taken all reasonable steps in the Outage Response Plan to improve its ability to restore service following an outage.⁹

⁸ Decision No. 66028.

⁹ Staff Report, May 20, 2004, page 9.

Table 3
Service Restoration Time (Minutes)
Following Outage of Existing 115 kV Transmission Line

Substation	Pre-Existing	Table 2 Improvements	46 kV Emergency Tie Addition	Second Line to Nogales
Valencia	110	45	45	0*
Sonoita	150	55	55	0*
Cañez	190	60	10	10
Kantor	245	65	5	5

Notes:

1. Source - TEP and UES Supplemental Response, April 30, 2004, page 9.
2. Assumes evening or weekend event for “pre-existing” restoration time.

*** Continuity of service for transmission line outage**

TEP and UES have identified system voltage as a prevailing factor effecting quality of service in Santa Cruz County.¹⁰ This resulted in the 2004 installation of 25 megavolt-amperes reactive (“MVAR”) of shunt capacitors dispersed among feeders originating from each of the UES distribution substations in Santa Cruz County. To verify voltage concerns are being properly managed by the respective utilities, Commission Decision No. 67151 requires that TEP and UES document, upon request of Staff, enforcement of its customer power factor requirements and all system improvements made to assure system voltage is within WECC and National Electric Safety Code (“NESC”) requirements.

Staff has chosen to utilize the most recent UES interruption report filed with the Commission to update quality of distribution service for Santa Cruz County. This allows a direct comparison of the most recent interruption data with the 1998 data originally analyzed by Staff. The UES July 2003 interruption report for Santa Cruz County has been provided as Exhibit 4. It indicates that the average annual hours of outage experienced by a Santa Cruz County customer rose from 0.8 hours in July 2002 to 2.4 hours in July 2003. The associated annual number of customer service interruptions rose from 171 in July 2002 to 258 in 2003. These statistics indicate 2003 resulted in more disruptions in service than occurred in 2002. However, the interruptions of service in 2002 and 2003 were significantly improved over that reported for 1998. This is partially due to no transmission outages occurring in 2002 and only three relatively short transmission outages occurring in 2003. This contrasts with the four transmission outages in 1998 that resulted in an average 7.5 hours of service interruption per customer.

Unfortunately, comparison of 1998, 2002 and 2003 electric service interruptions in Santa Cruz County is not a definitive indicator of the quality of distribution service afforded UES customers today. Certainly, it does capture the benefits of the myriad of improvements in Santa

¹⁰ TEP and UES Supplemental Response, April 30, 2004.

Cruz County distribution system facilities, operations and service restoration procedures made by Citizens, TEP and UES since 1998. However, the random frequency and effects of storm related events are intrinsically embedded in these statistics. Such weather related events are a major contributor to distribution service interruptions.

In order to better account for statistical aberrations in customer service interruption data caused by random events, Decision No. 67151 requires that TEP and UES begin collecting system data to establish SAIDI, SAIFI, and CAIDI as defined per IEEE Standard 1366 for their respective systems on an on-going basis. This will allow Staff to ascertain in the future whether TEP and UES distribution service reliability is improving or deteriorating over time. The requirement to commence collecting such reliability data was imposed upon TEP and UES on August 3, 2004. However, it is Staff's opinion that sufficient time has not been allowed for accumulation of a consistent distribution system reliability database for the UES' Santa Cruz County system. This is supported by IEEE Standard 1366 – 2003 which indicates a data period of five years is appropriate for properly ascertaining trends in distribution system reliability indices.

Customer complaints regarding quality of service in Santa Cruz County have dissipated since 1998 as the numerous improvements to distribution system facilities, operational practices and service restoration procedures have been made by Citizens, TEP and UES. It is Staff's opinion that distribution service in Santa Cruz County is appreciably better today than in 1998. Nevertheless, none of the distribution system improvements and operational improvements made by Citizens, TEP and UES can ensure continuity of service following a transmission line outage.

STATUS OF TRANSMISSION SERVICE TO SANTA CRUZ COUNTY

Santa Cruz County is currently served by a single 115 kV transmission line. A transmission line outage therefore results in an extended interruption of service to customers in Santa Cruz County. Such transmission service fails to comply with the WECC minimum operating reliability criteria ("MORC") primary objective to assure continuity of service to load during a transmission disturbance. In fact, the primary cause of Santa Cruz County customer complaints regarding service degradation in 1998 was attributable to four transmission line outage events of lengthy duration. Staff concluded in 1999 that the quality of transmission service to customers in Santa Cruz County was unacceptable¹¹ Customers' complaints about the frequency and duration of such transmission outages that leave them without air conditioning during the deadly heat of summer are justified. For these reasons the Commission ordered Citizens in Decision No. 62011 to construct a second transmission line to Nogales, Arizona by December 31, 2003.

Transmission line outages are prevalent in Santa Cruz County during summer storm season due to lightning activity and strong winds accompanying annual monsoon weather activity. Such transmission outages continue to plague Santa Cruz County customers today. On

¹¹ Docket No. E-01032A-98-0611, April 6, 1999, Testimony of Jerry D. Smith, page 4, lines 12-18.

May 3, 2004, TEP and UES provided an updated transmission line outage history for Santa Cruz County as depicted in Table 4.¹² Such outages will continue to occur with random frequency and duration and will result in customer outages until such time that a second transmission line is constructed to Nogales. Only then, will customers be able to expect continuity of service for a transmission line outage in accordance with WECC MORC principles of operation.

Table 4
115 kV Transmission Line Outage History

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
No. of Interruptions	1	2	1	4	6	4	4	0	1

The need for a second transmission line to Santa Cruz County has been acknowledged for many years. Staff first found a reference to the need for such a line in a 1971 report filed with the Commission.¹³ However, the second transmission line was not pursued for budgetary reasons until the Commission ordered Citizens in Decision No. 62011 to construct a second transmission line to Nogales, Arizona by December 31, 2003. The Commission approved a Certificate of Compatibility ("CEC") for the proposed second transmission line on January 15, 2002 via Decision No. 64356. The federal NEPA process subsequently lead to a January 2005 Final Environmental Impact Statement ("FEIS") that indicates the United States Forest Service ("USFS") preference for a transmission line corridor that differs from that authorized by the Commission's CEC. Furthermore, numerous individuals and parties challenged the need for the second transmission line and suggested there were other alternatives during the course of the NEPA process. For these reasons the Commission reopened this case for reconsideration of the need for the second line and available alternative solutions. Therefore, mitigation of continuity of service concerns continues in abeyance while the merits of the Gateway 345 kV and 115 kV Transmission Project are revisited.

What has occurred over the past 34 years is the old 44 kV system that originally served Santa Cruz County was replaced by the existing 115 kV transmission line and the old 44 kV system (substations, generators and lines) retired and removed from service. Citizens also made a number of transmission improvements in 1999 that have improved the performance of the 115 kV transmission line. A 115 kV ring bus circuit breaker scheme was constructed at the Nogales Tap Substation which is located at the northern terminus of the transmission line. Sectionalizing 115 kV circuit breakers were also installed at Sonoita Substation. Maintenance and repair improvements were made to the existing 115 kV line to assure effective circuit grounding and lightning strike protection. All of these improvements are effective in reducing the frequency and scope of customer service interruptions resulting from a 115 kV transmission line outage.

¹² May 3, 2004 Errata to TEP and UES Supplemental Response to Commission Question, Exhibit D, April 30, 2004.

¹³ Quality of Service Investigation, Citizens Utilities Company, Santa Cruz and Mohave Division, September 1971.

Nevertheless, these improvements do not ensure continuity of service following a transmission line outage.

During the past few years it has become apparent to Staff that additional transmission concerns are emerging in Santa Cruz County. By 2008, the Santa Cruz County load is forecast to exceed the 67 megawatt ("MW") capacity of the existing 115 kV line.¹⁴ This will require that the Valencia generating units will be required to run during peak hours of the year. The electric industry refers to such situations as a Reliability-Must-Run ("RMR") condition. As load growth continues in future years it will necessitate additional hours of RMR energy production from the Valencia generating units. The TEP and UES RMR study indicates that this service concern can be managed technically via the RMR operation of the Valencia generating units until the Santa Cruz County load reaches approximately 75 MW. According to the UES forecast the 75 MW load level may be experienced by the summer of 2010.

This does not imply that UES has a resource adequacy problem. UES has a full requirements supply agreement with Pinnacle West Capital Corporation ("PWCC"). However, the economic impact of RMR operation of the Valencia units is significant because UES has a full requirements power purchase contract with Pinnacle West Capital Corporation ("PWCC"). Therefore, operating expenses of the Valencia units will occur on top of and above the cost of the capacity and energy otherwise contracted for and purchased from PWCC.

While a second transmission line will solve the continuity of service concerns following a transmission outage it will not resolve the RMR condition for Santa Cruz County. The RMR condition would continue to exist even with construction of the Gateway 345 kV and 115 kV Project. The second line does not resolve the RMR condition because the capacity of the existing line and Valencia generating units would still limit service to Santa Cruz County for the outage of the new 115 kV line.

It is Staff's opinion that transmission service to Santa Cruz County is no better today than it was when the Commission ordered construction of the second transmission line. Continuity of service following a transmission line outage will not be achievable until a second transmission line is in service. Furthermore, transmission delivery service to Santa Cruz County will begin to deteriorate in 2008 as a result of depending upon RMR generation to meet peak load. By 2010 the UES transmission and generation infrastructure will be unable to reliably meet the load serving demands of Santa Cruz County even if the Gateway 345 kV and 115 kV Project is constructed. Therefore, Staff concludes a second transmission line must be accompanied by additional transmission or generation infrastructure improvements by 2010. Otherwise, Santa Cruz County customers will be exposed to interruptions of service or planned curtailments during peak hours of the year.

¹⁴ May 20, 2004 Staff Report, Docket No. E-0132A-99-0401.

ANALYSIS OF ALTERNATIVE TRANSMISSION RELIABILITY SOLUTIONS

The Commission invited all parties at its July 28, 2004 Special Open Meeting to file pleadings in the event that they thought there were alternative plans or ideas relating to the transmission reliability issue in Santa Cruz County. Similarly, all parties were urged in the March 14, 2005 Procedural Order to heed the Commission's desire for a fresh look at this problem. Unfortunately no pleadings of alternative plans have been filed with the Commission since the July 28, 2004 Special Open Meeting. This voids Staff's opportunity to analyze the merits of specific alternative plans or ideas envisioned by others. However, this has not deterred Staff's renewed consideration of alternative solutions analyzed in the past.

Staff has throughout the duration of this case analyzed a variety of potential generic solutions to the transmission reliability concerns in Santa Cruz County. The solutions that Staff has previously considered fall into four generic categories: 1) a "No Action Alternative", 2) distribution alternatives, 3) generation alternatives and 4) transmission alternatives. The "No Action Alternative" means that the proposed second transmission line is not built. This is the default alternative that has been in effect since the 1999 Commission order to construct a second transmission line.

Staff described the consequences of the "No Action Alternative" in its comments to the Draft Environmental Impact Statement ("DEIS").¹⁵ Those comments are provided as Exhibit 7. Staff advised the United States Department of Energy ("DOE") and other cooperating Federal Agencies that the Commission had established a need for a second transmission line to resolve major electric service concerns for the approximately 13,000 customers of Santa Cruz County.¹⁶ The number of customers has since risen to approximately 15,000 and represents approximately 40,000 residents in 2004. Similarly, the Commission has established that there are no other technical solutions to assure continuity of service during the outage of the sole transmission line serving these customers.¹⁷ Application of this alternative beyond 2008 yields additional transmission service complications in the form of RMR generation obligations. If this alternative remains in affect beyond 2010, the residents of Santa Cruz County can expect rolling blackouts or curtailments of growing frequency and duration during peak hours of the years. Clearly, the "No Action Alternative" is not in the public interest.

Distribution lines are constructed to delivery power from a single substation in order to assure distribution system equipment operates within technical design parameters. Distribution feeders are not designed to operate as a network interconnecting multiple substations. The distribution system does not operate in parallel with the transmission system for this reason; rather, it operates in series with the transmission system. Therefore, distribution improvements provide no means of assuring continuity of service during a transmission line outage. Distribution improvements are similarly ineffective in resolving RMR generation conditions.

¹⁵ Staff October 14, 2003 Comments on Sahuarita-Nogales Transmission Line DEIS, DOE/EIS-0336.

¹⁶ Docket No. E-01032A-99-0401, Decision No. 62011, November 2, 1999.

¹⁷ Docket No. L-00000C-01-0111, Decision No. 64356, January 15, 2002.

Closing emergency distribution feeder ties between distribution substations does provide an opportunity for service restoration for a neighboring substation interrupted by a transmission outage. This is the limited purpose of the 46 kV emergency distribution tie line constructed between TEP's Canoa Substation and UES' Kantor Substation. Construction of the 46 kV emergency distribution line does reduce the time to restore service to Kantor and Cañez Substations following a transmission line outage by 50-60 minutes. This operational benefit is vital until such time that continuity of service following a transmission line outage is resolved.

Staff has also determined that generation alternatives are not an effective solution for loss of the existing 115 kV transmission line. Operation of the Valencia generating units does not assure continuity of service following outage of the existing transmission line because the units trip off line for an outage of any portion of the existing 115 kV line.¹⁸ Similarly, new local generation does not pre-empt the need for a second transmission line. New local generation would be susceptible to tripping off line for a transmission line outage just like the Valencia units until a second transmission line connects Nogales to the Arizona transmission grid. This reality was acknowledged by DOE and cooperating Federal Agencies in the NEPA process and generation was identified as an alternative considered but eliminated from further analysis.¹⁹

Generation can be an effective technical solution to transmission delivery limitations once a second transmission line connects Nogales to the Arizona transmission grid. At that point in time, concerns regarding the continuity of service following a transmission line will have been resolved. Then the 2010 RMR generation limitation with a second transmission line in service is what remains to be solved. The limitations of the 2010 RMR generation condition can be technically resolved by either transmission improvements or addition of more local generating capacity. TEP and UES have committed to studying and analyzing the merits of both types of solutions: 1) new local generation capacity and 2) upgrades in the existing 115 kV transmission line or construction of a second transmission line from Gateway to either Valencia or Sonoita. The economics of these competing technical solutions often dictates the choice of an alternative for implementation.

The forth category of solutions previously considered by Staff involves transmission system improvements. Staff has determined that as long as a single transmission line is the sole means of connecting Santa Cruz County to the state grid, continuity of service cannot be achieved for outage of that line.²⁰ Construction of a second transmission line is the only technical means of achieving continuity of service following outage of the existing 115 kV line.

The Commission's order requiring construction of a second transmission line did not specify the nominal system voltage necessary for such a line. This was intentionally done to allow Citizens' selection and pursuit of the most expedient transmission line solution available. The existing transmission line is designed and operated at 115 kV. To ensure continuity of service following outage of the existing line, 115 kV is the lowest nominal system voltage that is

¹⁸ Jerry D. Smith, Direct Testimony, Docket No. L-00000C-01-0111, May 3, 2001, p.3

¹⁹ Sahuarita-Nogales Transmission Line, January 2005 FEIS, DOE/EIS-0336, p.2-22

²⁰ Jerry D. Smith, Testimony, Docket No. L-00000C-01-0111, May 3, 2001, p.3

acceptable for the second transmission line to Nogales. That is the reason a 115 kV line has been approved from the new Gateway Substation to Valencia Substation.

Citizens chose to take advantage of TEP's proposal to build a double circuit 345 kV line from Gateway to secure its second interconnection with the Arizona transmission grid. TEP's purpose for proposing the 345 kV line was to enable an interconnection with Mexico. As long as TEP chooses to continue its pursuit of such an interconnection with Mexico the Gateway 345 kV line seems to be the minimum size and voltage class of transmission facility needed between South Substation and Gateway.²¹

In the meantime, UES has acquired Citizens' electric system in Santa Cruz County. Operational integration of the UES electric system in Santa Cruz County with TEP's system in Tucson is an expectation of the Commission approved acquisition. TEP utilizes 138 kV as its nominal high voltage ("HV") transmission system voltage. At some point in time there may be an opportunity or desire to convert the Santa Cruz County transmission system voltage from 115 kV to 138 kV to gain increased transmission delivery capability. This is feasible because the megawatt transmission delivery capacity of a given conductor increases proportional to the system voltage at which it is operated. In other words, the megawatt rating of a 138 kV transmission line is higher than a 115 kV transmission line utilizing the same conductor. This is an important consideration as TEP and UES studies transmission solutions to the Santa Cruz County RMR limitation expected in 2010 even with the construction of second transmission line.

STAFF CONCLUSIONS AND RECOMMENDATIONS

Staff has revisited the topic of quality of electric service in Santa Cruz County in this report. An update of quality service prevalent today has been compared with what Staff found to exist in its 1999 investigation. Staff offers the following conclusions and opinions based upon an effort to think outside the box regarding service concerns and potential solutions for consumers in Santa Cruz County.

1. Numerous improvements to distribution system facilities, operational practices and service restoration procedures have been made by Citizens, TEP and UES since Staff made its 1999 finding of unacceptable service.
2. Customer complaints regarding quality of service in Santa Cruz County have dissipated since 1998 as the above numerous improvements have occurred.
3. It is Staff's opinion that distribution service in Santa Cruz County is appreciably better today than in 1998.

²¹ Sahuarita-Nogales Transmission Line, January 2005 FEIS, DOE/EIS-0336, p.2-24

4. Nevertheless, none of the distribution system improvements and operational improvements made by Citizens, TEP and UES can ensure continuity of service following a transmission line outage.
5. It is Staff's opinion that transmission service to Santa Cruz County is no better today than it was when the Commission ordered construction of the second transmission line. Continuity of service following a transmission line outage will not be achievable until a second transmission line is in service.
6. Transmission delivery service to Santa Cruz County will begin to deteriorate in 2008 as a result of depending upon RMR generation to meet peak load.
7. By 2010 the UES transmission and generation infrastructure will be unable to reliably meet the load serving demands of Santa Cruz County even if the Gateway 345 kV and 115 kV Project is constructed. Therefore, Staff concludes transmission or generation infrastructure improvements complementing the second transmission line need to be in place by 2010. Otherwise, Santa Cruz County customers will be exposed to interruptions of service or planned curtailments during peak hours of the year.

Therefore, Staff recommends that construction of second transmission line to Santa Cruz County remain a priority. This is the only technical means of assuring continuity of service to consumers for a transmission line outage. Secondly, Staff recommends that a technical solution to the RMR generation condition commencing in 2008 must be selected by December 31, 2005 in order to ensure timely implementation. Finally, Staff remains open to considering the merits of different nominal system voltages for the second transmission line to Nogales and various transmission and generation solutions to the RMR condition that any party chooses to suggest.